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Serial No. 10/766,739
OKI.612
Amendment dated April 10, 2007

REMARKS

Claims 12-16 and 28-34 are pending in the present application. Claims 3-7 and 9 have been canceled.

Claim Rejections-35 U.S.C. 102

Claims 3, 5-7 and 9 have been rejected under 35 U.S.C. 102(b) as being anticipated by the Higashi et al. reference (U.S. Patent No. 6,342,444). Claims 3, 5-7 and 9 have been canceled. The Examiner is therefore respectfully requested to withdraw this rejection.

Claim Rejections-35 U.S.C. 103

Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the Higashi et al. reference in view of the Yu et al. reference (U.S. Patent No. 6,958,291). Claim 4 has been canceled. The Examiner is therefore respectfully requested to withdraw this rejection.

Claims 12-15 and 33 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the Lim et al. reference (U.S. Patent No. 6,380,084) in view of the Higashi et al. reference. This rejection is respectfully traversed for the following reasons.

The wiring structure of claim 12 includes in combination among other features a first insulating film "having plural grooves formed therein, which has an interface in a

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horizontal direction between adjoining grooves”; and plural cap films “formed at least on upper faces of the wiring films, and which are each separated by the grooves, wherein the first insulating film has plural protrusions protruding from the interface, and the grooves are formed in the protrusions, ... and the cap films have substantially the same shape as uppermost faces of the protrusions”. Applicant respectfully submits that the wiring structure of claim 12 would not have been obvious in view of the prior art as relied upon by the Examiner for at least the following reasons.

The Examiner has primarily relied upon Fig. 14 of the Lim et al. reference as meeting the features of claim 12. The Examiner has acknowledged that the Lim et al. reference however fails to specify that the wiring structure includes plural cap films formed at least on upper faces of the wiring films, which are separated by the grooves and have substantially the same shape as uppermost faces of the protrusion.

In an effort to overcome these acknowledged deficiencies of the Lim et al. reference, the Examiner has asserted that the Higashi et al. reference “teaches that a cap film may be selectively formed only on wiring in order to reduce the capacitance (col 3 ln 8-18) and wiring resistance”. The Examiner has asserted that it would have been obvious to one of ordinary skill to use the teachings of the Higashi et al. reference on the device of the Lim et al. reference to reduce capacitance and wiring resistance. The Examiner has further asserted that the resulting structure would have a selective cap layer on the wiring that meets the limitation wherein cap films are formed on upper faces of the wiring films and have substantially the shape as uppermost faces of the

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protrusions. Applicant respectfully disagrees for the following reasons.

As acknowledged by the Examiner, Fig. 14 of the Lim et al. reference as primarily relied upon does not include a cap film. Of note, the Examiner has apparently interpreted the top surface of dielectric layer 72 around wiring film 84 and barrier layer 80 as the protrusion of the first insulating film of claim 12, whereby the groove is formed in the protrusion.

As shown in Fig. 1G of the Higashi et al. reference as secondarily relied upon, TiN film 9, which is described as effective for non-diffusion of copper, is formed specifically on the top edges of TiN metal layer 5 and on copper metal layer 6. However, TiN layer 9 in Fig. 1G of the Higashi et al. reference does not extend to also cover an upper surface of insulation film 1, and more particularly does not also cover protrusions of insulation film 1 in which a groove is formed. TiN layer 9 in Fig. 1G of the Higashi et al. reference does not have substantially the same shape as uppermost faces of protrusions of insulating film. This should be especially clear because the Higashi et al. reference does not include protrusions of insulating films. One of ordinary skill therefore would have no motivation to modify the structure in Fig. 14 of the Lim et al. reference to include a cap film that specifically has the same shape as an uppermost face of a protrusion in view of the Higashi et al. reference, as would be necessary to meet the features of claim 12. Particularly, as noted above, TiN film 9 in Fig. 1G of the Higashi et al. reference is limited as being formed on the top edges of TiN metal layer 5 and on copper metal layer 6. Moreover, column 3, lines 14-16 of the Higashi et al.

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reference specifically teaches to selectively eliminate the barrier material other than that on the copper wiring. Applicant therefore respectfully submits that the wiring structure of claim 12 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection of claims 12-15 and 33, is improper for at least these reasons.

Claims 16, 28-32 and 34 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the Higashi et al. reference and the Lim et al. reference, in further view of the Yu et al. reference. This rejection is respectfully traversed for the following reasons.

The Yu et al. reference as shown in Figs. 7 and 8 for example, does not include a first insulating film having protrusions, with grooves formed in the protrusions. Accordingly, the Examiner's reliance upon the Yu et al. reference with respect to claim 16 does not overcome the above noted deficiencies of the primarily relied upon prior art. Applicant therefore respectfully submits that claim 16 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection of claim 16 is improper for at least these reasons.

The wiring structure of claim 28 includes in combination among other features a first insulating film "having plural protrusions in which grooves are formed...the first cap films have substantially the same shape as uppermost faces of the protrusions".

As noted above, the primarily relied upon Higashi et al. and Lim et al. references do not disclose or make obvious these features. The secondarily relied upon Yu et al.

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reference also fails to disclose or suggest these features, because the structures in Figs. 7 and 8 of the Yu et al. reference do not include a first insulating film having protrusions in which grooves are formed, whereby a cap film has substantially the same shape as an uppermost face of a protrusion. Applicant therefore respectfully submits that the wiring structure of claim 28 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection of claims 28-32 and 34 is improper for at least these reasons.

Double Patenting

Claim 3 has been rejected on the grounds of non-statutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,969,911. As noted above, claim 3 has been canceled. The Examiner is therefore respectfully requested to withdraw this rejection.

Conclusion

The Examiner is respectfully requested to enter and consider this Amendment. Particularly, the issues have been materially reduced by canceling claims 3-7 and 9. Accordingly, entry and consideration of this Amendment should not raise any new issues and should not be an undue burden.

The Examiner is respectfully requested to reconsider and withdraw the corresponding rejections, and to pass the claims of the present application to issue, for

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at least the above reasons.

In the event that there are any outstanding matters remaining in the present application, please contact Andrew J. Telesz, Jr. (Reg. No. 33,581) at (571) 283-0720 in the Washington, D.C. area, to discuss these matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment for any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0238.

Respectfully submitted,

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